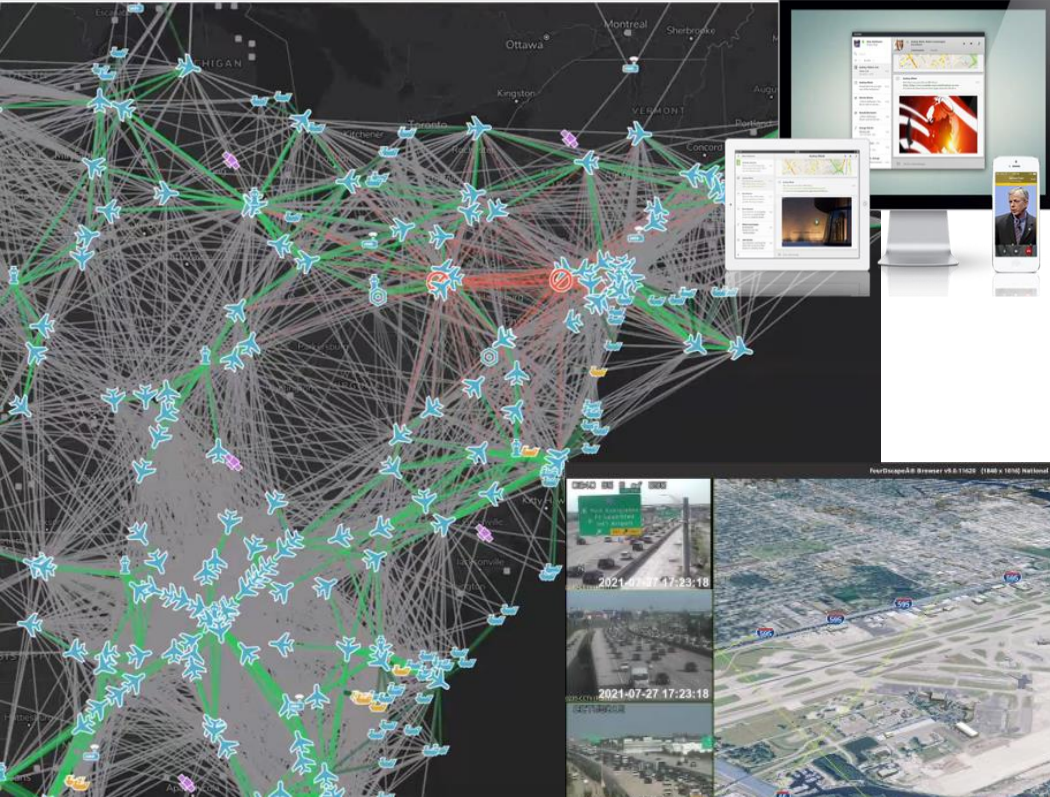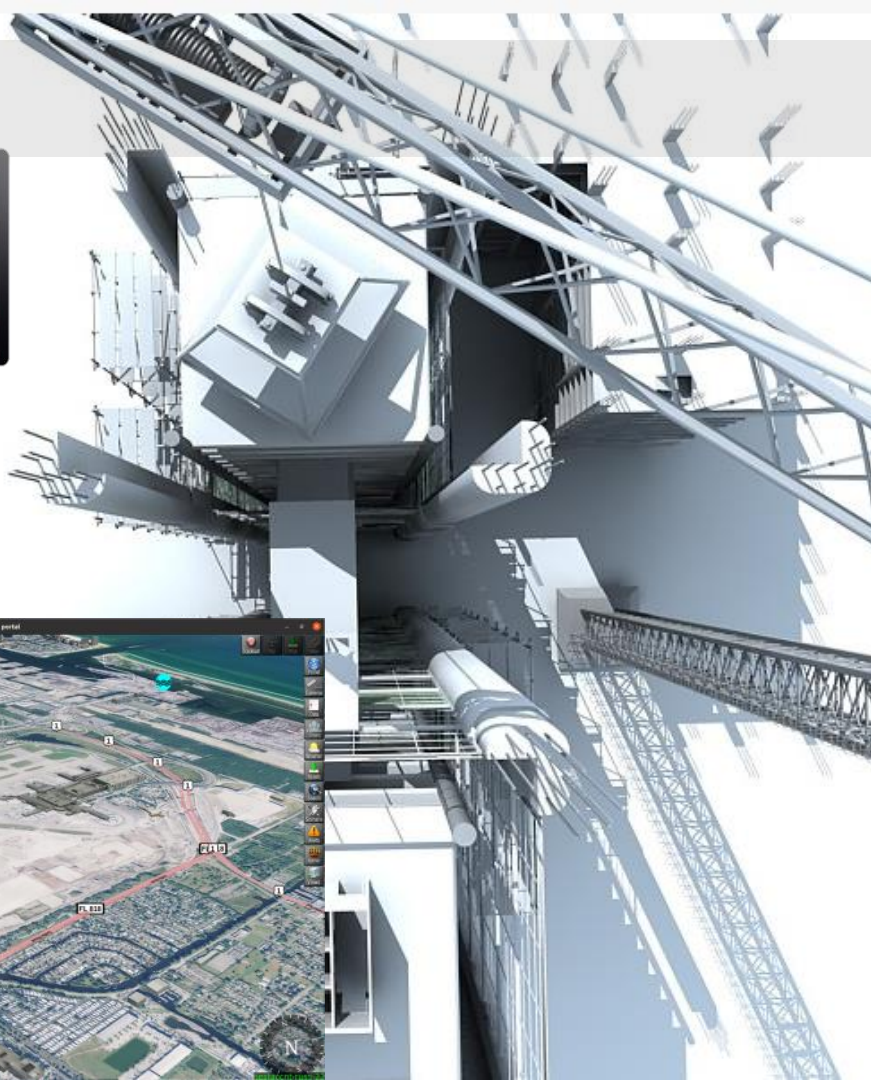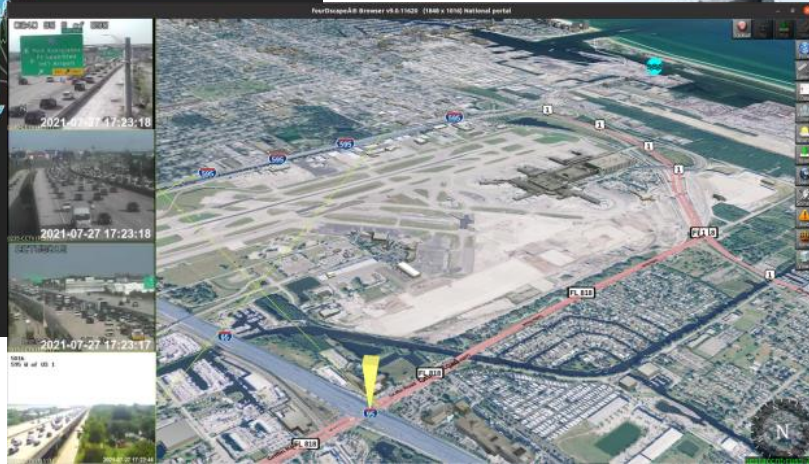# NAS of Tomorrow
Digital Twin FutureScape.

Challenge

The complexity of our National Air Space (NAS) requires an ability to digitally model, simulate and understand new and emerging technologies to safely and cost effectively create and implement the NAS of tomorrow.

A digital twin of the future has interdependencies spanning numerous environments saturated with complex systems of systems; both Analog and Digital.
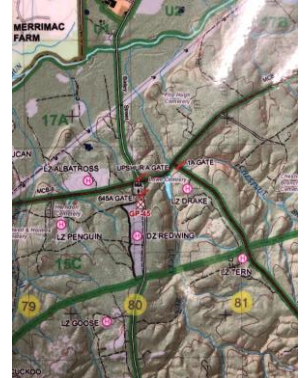
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Converging Domains

Space
High Altitude
Commercial Airspace
Low Altitude (UAS/Urban Taxi)
Ground
Maritime
Subterranean

Major Components

Communications
 - (RF, Data, Optical)
Security
 - (Physical & Cyber)
Sensor Systems
 - (Radar, Telemetry, IoT)
Information Management Systems
Airport Operations
Environmental (Weather, Geo-political, Economic)

Foundations for AI/ML

In 4 Weeks entire lives can change

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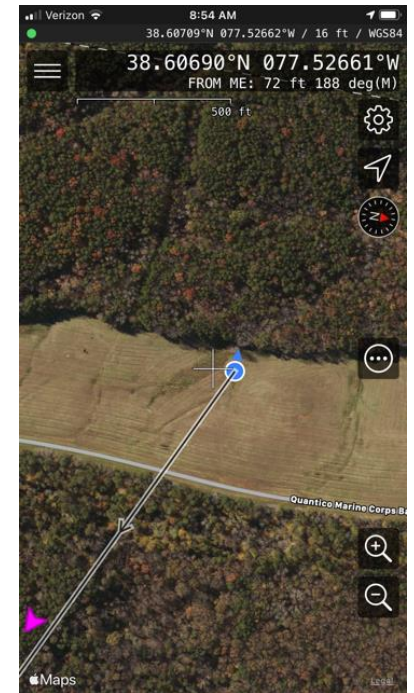
Applications of the Art and Science of technology innovation can make huge impacts

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Why a Digital Twin?

The Future starts with a Vision.

From the second an idea moves from the mind to paper it becomes one step closer to reality.

Big ideas need more than a sketch. The really need a Blueprint.

Getting from Idea to Blueprint backed by a precision plan to execute can be achieved in completely new ways.

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A Simple Idea.

The construction site of tomorrow embraces and integrates connected technology advancements.

It strives to clearly communicate vision and intent, then monitor progress along the way.

Upon completion of the project, many are repurposed and given new life with new roles.

The innovative leader in construction uses approaches like this today to optimize major infrastructure projects

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Smart. Very Smart.

Building Information Management (BIM) takes on a life of its own.

It introduces personality across new dimensions. Augmented Reality (AR) and Virtual Reality (VR) become useful tools.

And it collaboratively inter-connects us with immersive 3D without the accessories.

What do these technology innovations all have in common?

Ultra-secure Augmented and virtual assisted Building Information and Systems Management.

Digital Freedom.

Conceptualization, Design, Engineering, Stress Testing all take place in digital domains today.

Intellectual property is created at every step.

Customer value is generated each time we find better ways to lock in on their vision.

Shareholder value increases as we decrease the time between Ideation, Design, Finance, Planning and Execution.
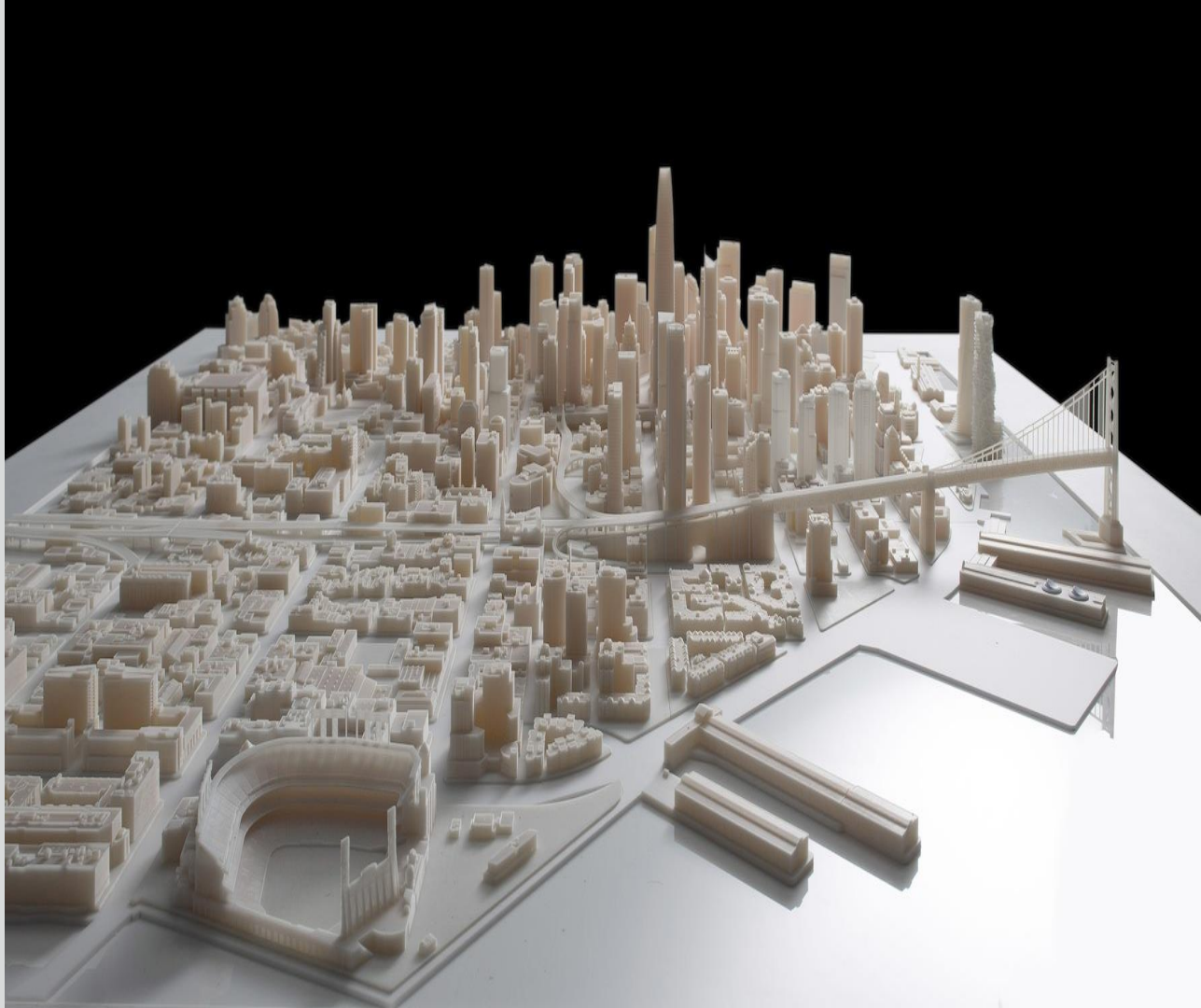
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Digital Expression.

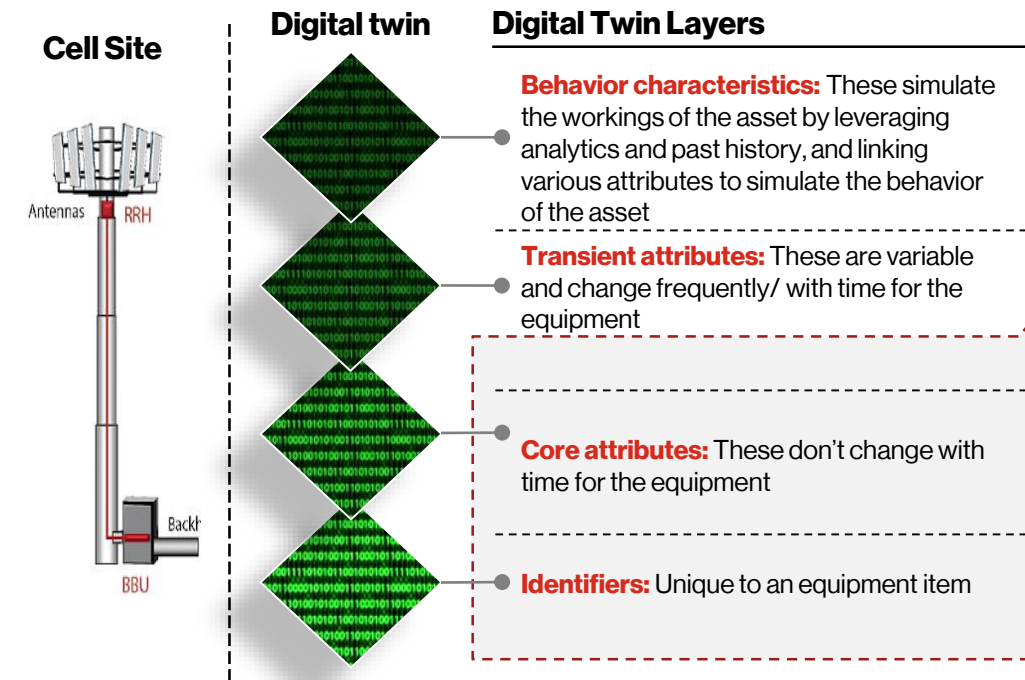The tools we use are evolving faster than ever before.

Every few steps a new breakthrough is achieved. Fidelity increases with each pass.

From lines on a paper to a fully rendered model in 3D form, digitization is driving autonomy and necessitating Artificial Intelligence & Machine Learning.

We already do this today. Now we just need to scale. REALLY BIG.

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Digital twin is a key construct for us.

Cell Site

Antennas RRH

Backh

BBU

Digital twin

Digital Twin Layers

Behavior characteristics: These simulate the workings of the asset by leveraging analytics and past history, and linking various attributes to simulate the behavior of the asset

Transient attributes: These are variable and change frequently/ with time for the equipment

Core attributes: These don't change with time for the equipment

Identifiers: Unique to an equipment item

MVP enables

- Accurate counts of network equipment at every cell site

- Detailed configuration (including vendor, make)

- Understand already installed capabilities

- Granular cost assumptions for network capital planning

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Imagine.

What if we could see networks, security, communications, information systems, aircraft, relationships and interdependencies all in a modeled view of reality today?
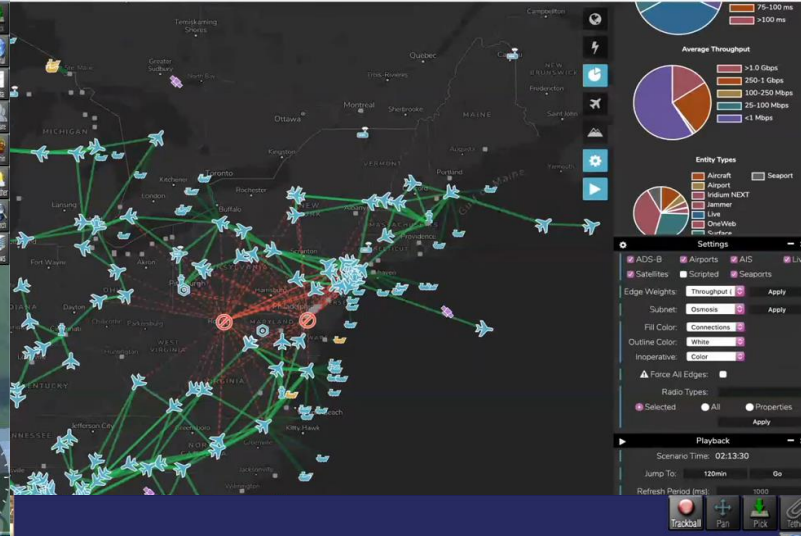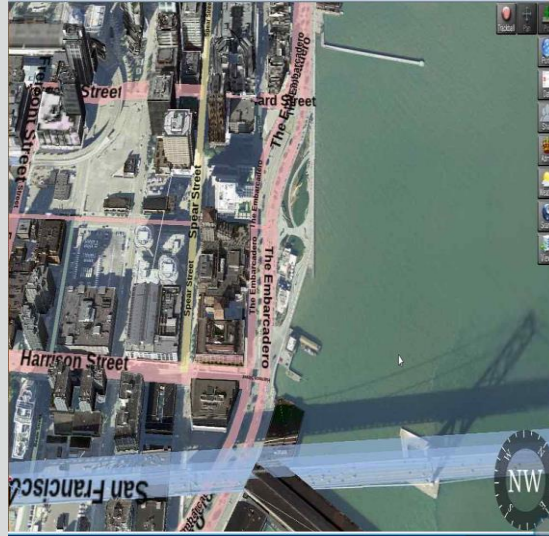
Innovation Project
Artificial Intelligence (AI) Common Operating Picture Fusion

Overview

All Source Signals Intelligence & Interoperability Platform delivering a National to Local level AI Enhanced Common Operating Picture (COP)

- Signals Intelligence workflow automation

- Provides 3D mapping in Air, Ground, Maritime and Subterranean. 4th dimensional AR/VR overlay.

- Uses Software Defined Perimeter (SDP) as control channel architecture (C2A).

- Integrated w 30+ SA OCR technologies and tested during OCR2017-OCR2019.

- Connects DoD and Private Sector as force multipliers to Public Sector solutions in our portfolio.
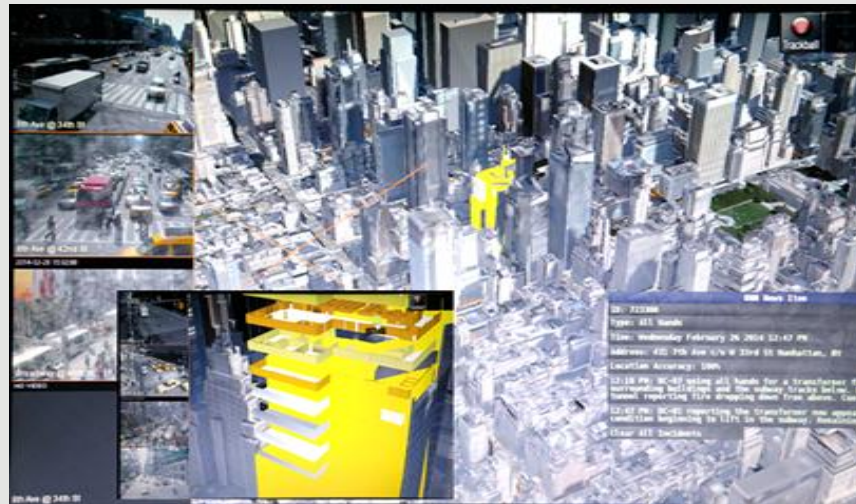
Integration examples:

AEGEX, ATAK, BlueForceDev, Bounce, Coras, DeDrone, DJI, Dynamis Cobra, EdgyBees, Fhoosh, Genetec, Klas Telecom, IBM Weather, Intrepid, Kodiak PTT+, Mutualink, NOAA, NWS, RAD, SDP Mobile Browser, Sarcos Guardian, Skyward, ShotSpotter, SuperDroid, Telogis, Tsunami, TwoSix RAD, USGS, VZConnect

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4D Visualization
Understanding the Fit

Beta National Portal

All Source Common Operating Picture. Interoperability bridge between disparate systems permitting Software Defined Perimeter/Zero Trust Network based exchange of information when needed.

Key Features:

- Interactive, 3D Models of cities, bridges, tunnels, airspace and maritime.

- Integrated video from public and private domains

- Telemetry from vehicle tracking, airborne assets, unmanned assets, maritime vessels.

- Active radar and weather overlays.

- Seismic, flood gauge and buoy data

- VR Overlay and airspace flight modeling/simulation

- SDP based secure phone video, alert end-points

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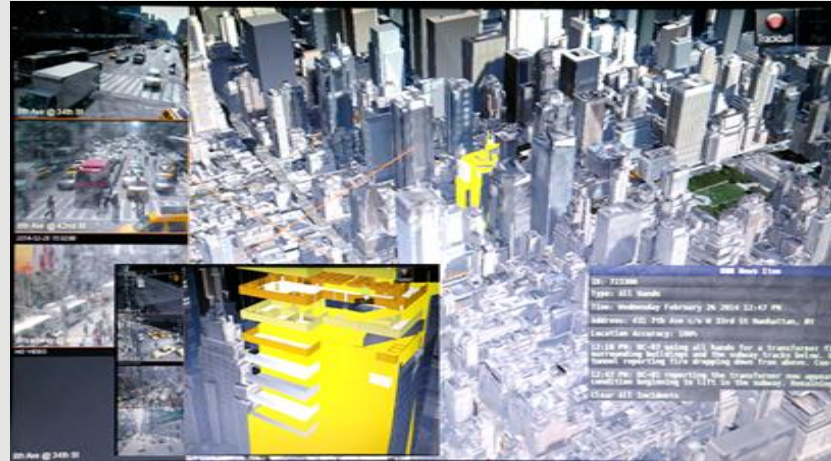
Avatar based real-time situational immersion

A new take on the 'Common Operating Picture'
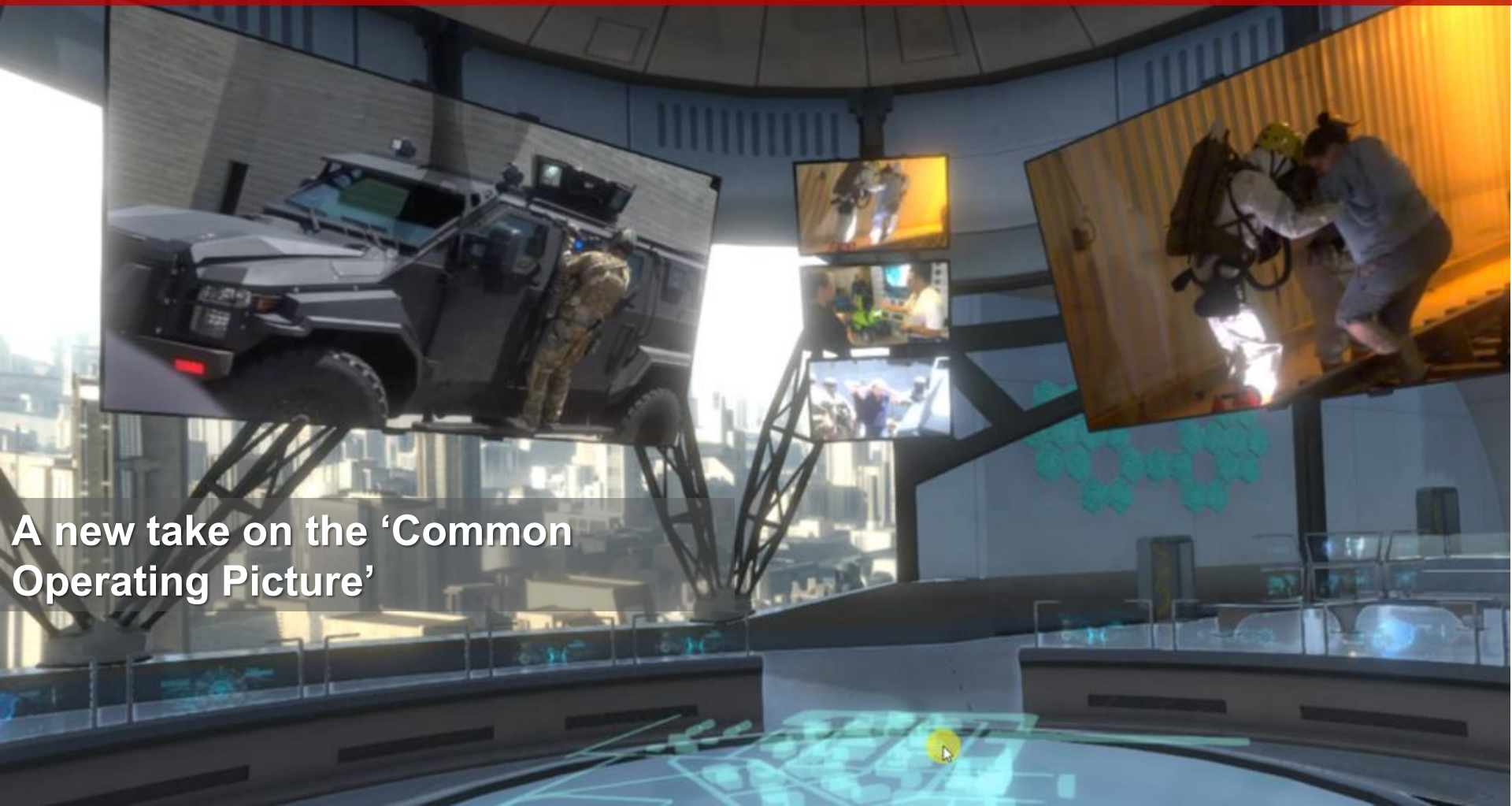
Interactive 3D holographic terrain models

00:55
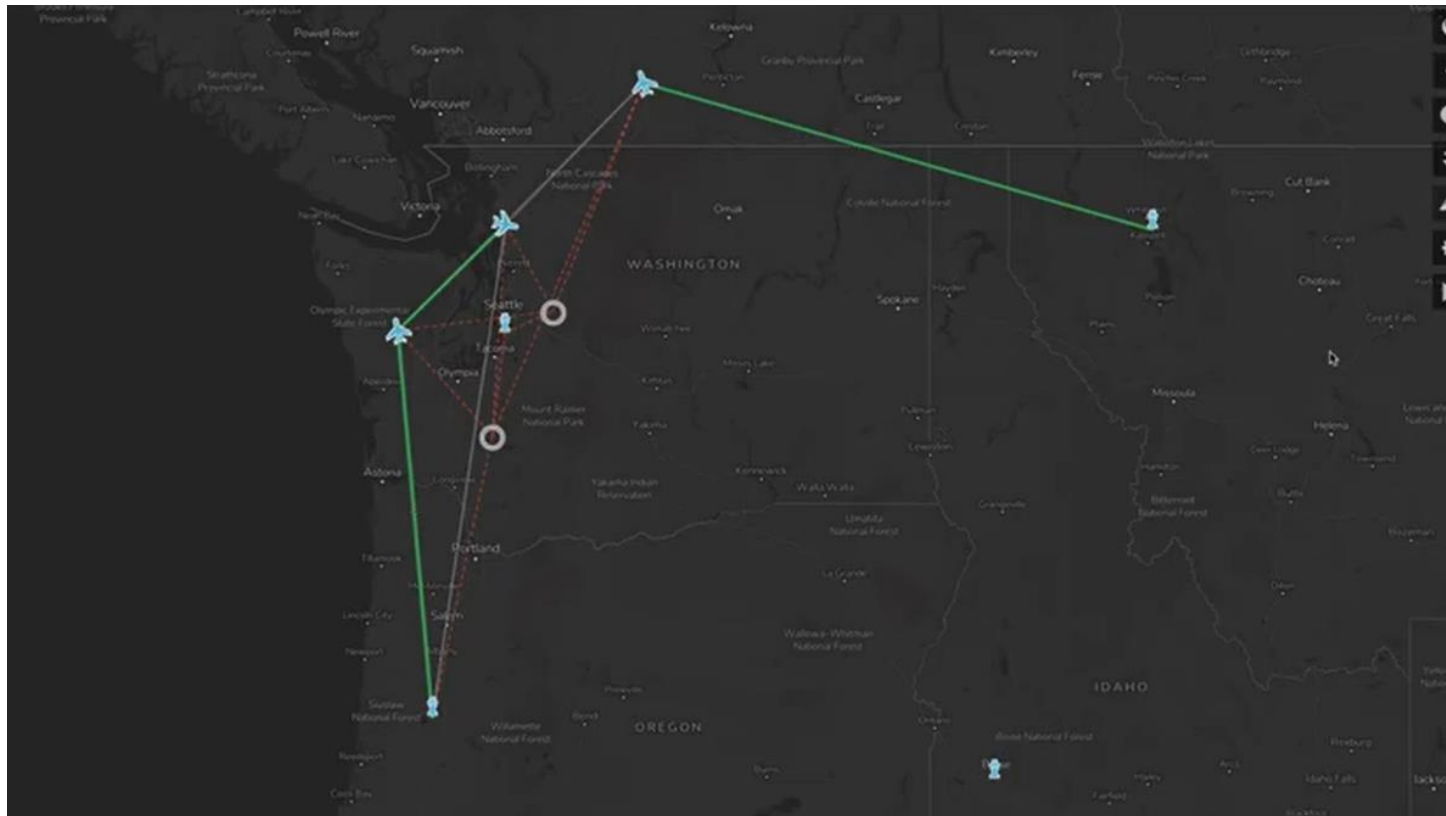
Digital Twin Concept

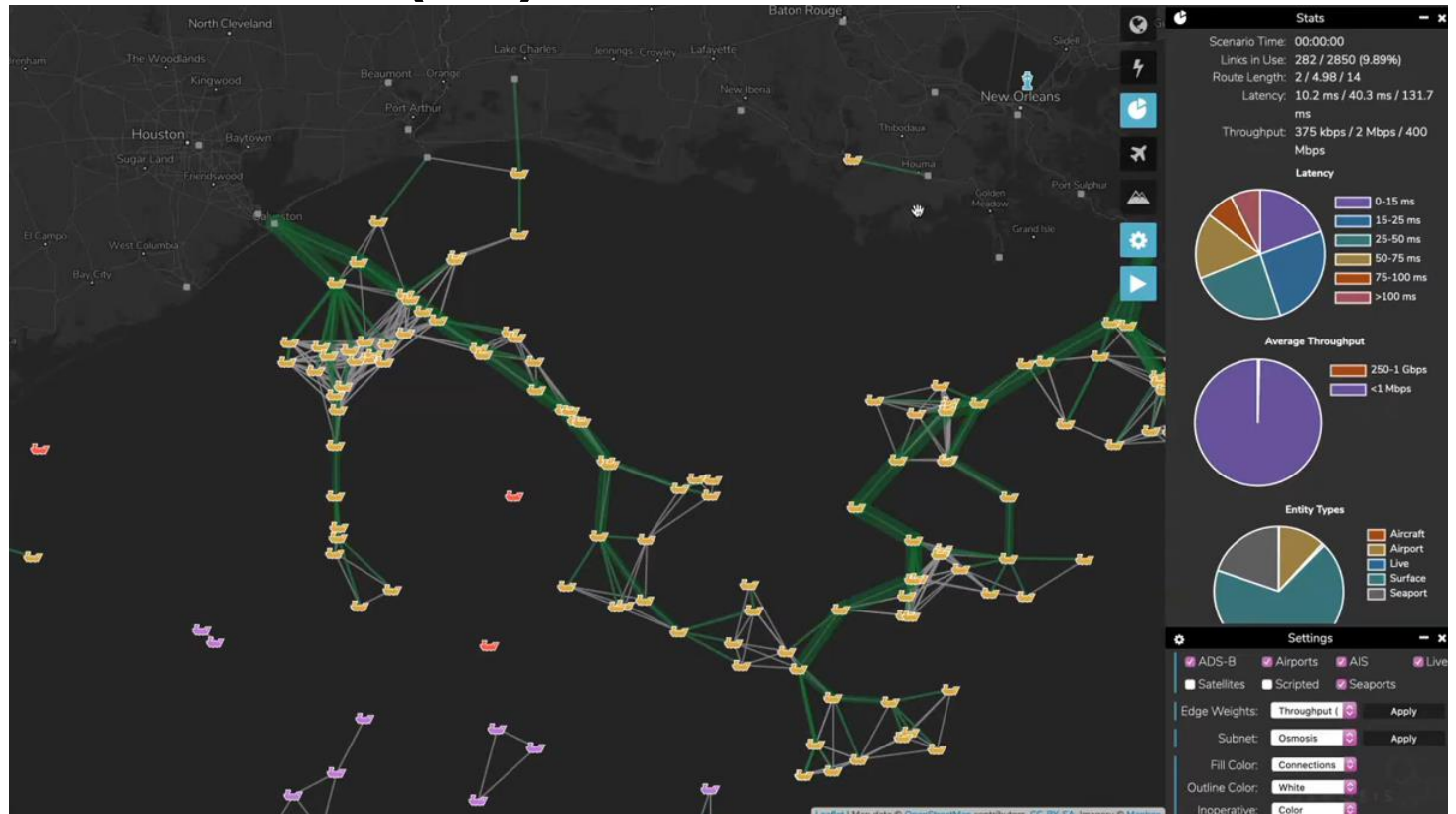**Modeling the National Air Space (NAS)**

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Air – Air - Ground
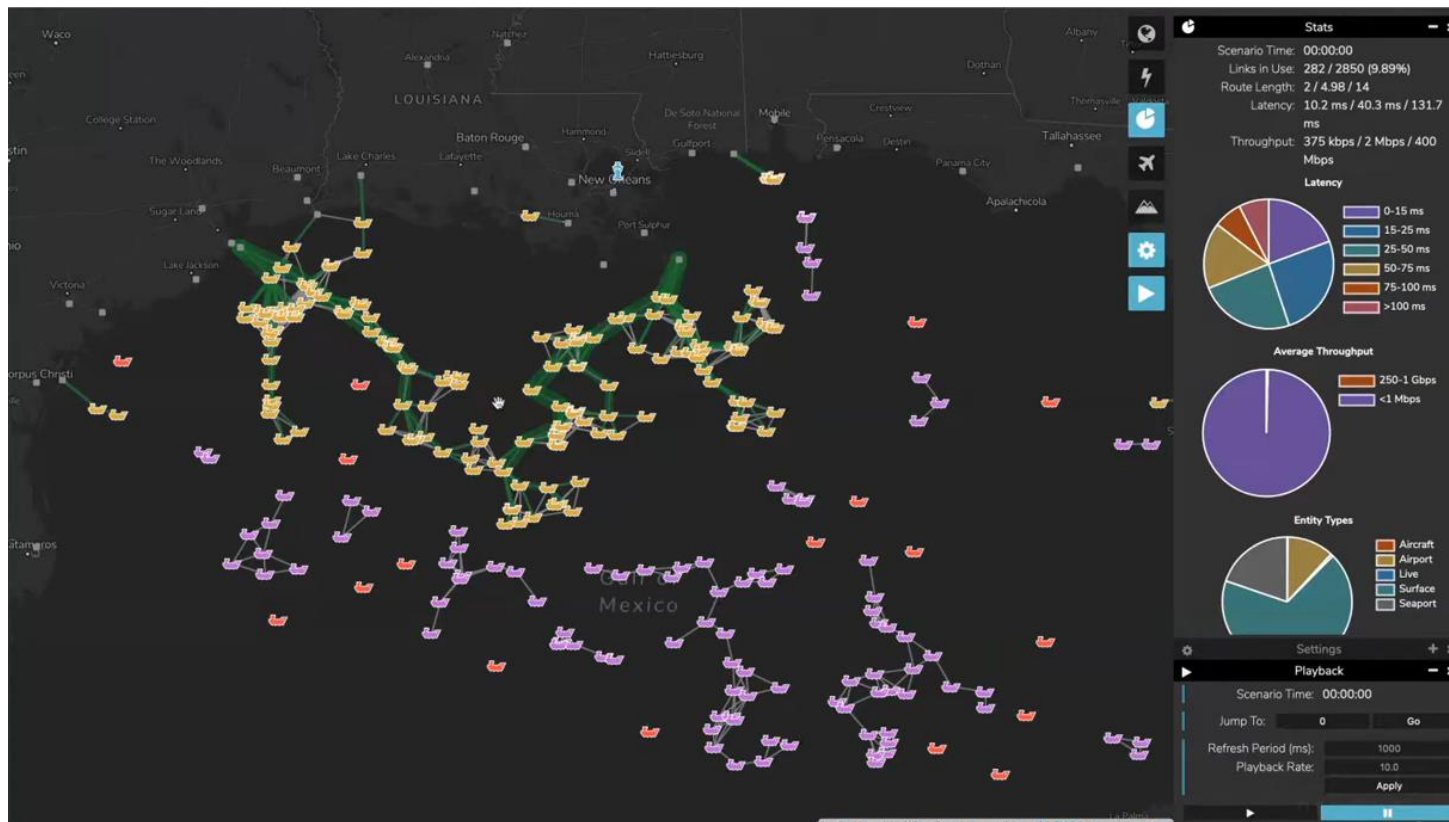
Airborne Communications Propagation

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19
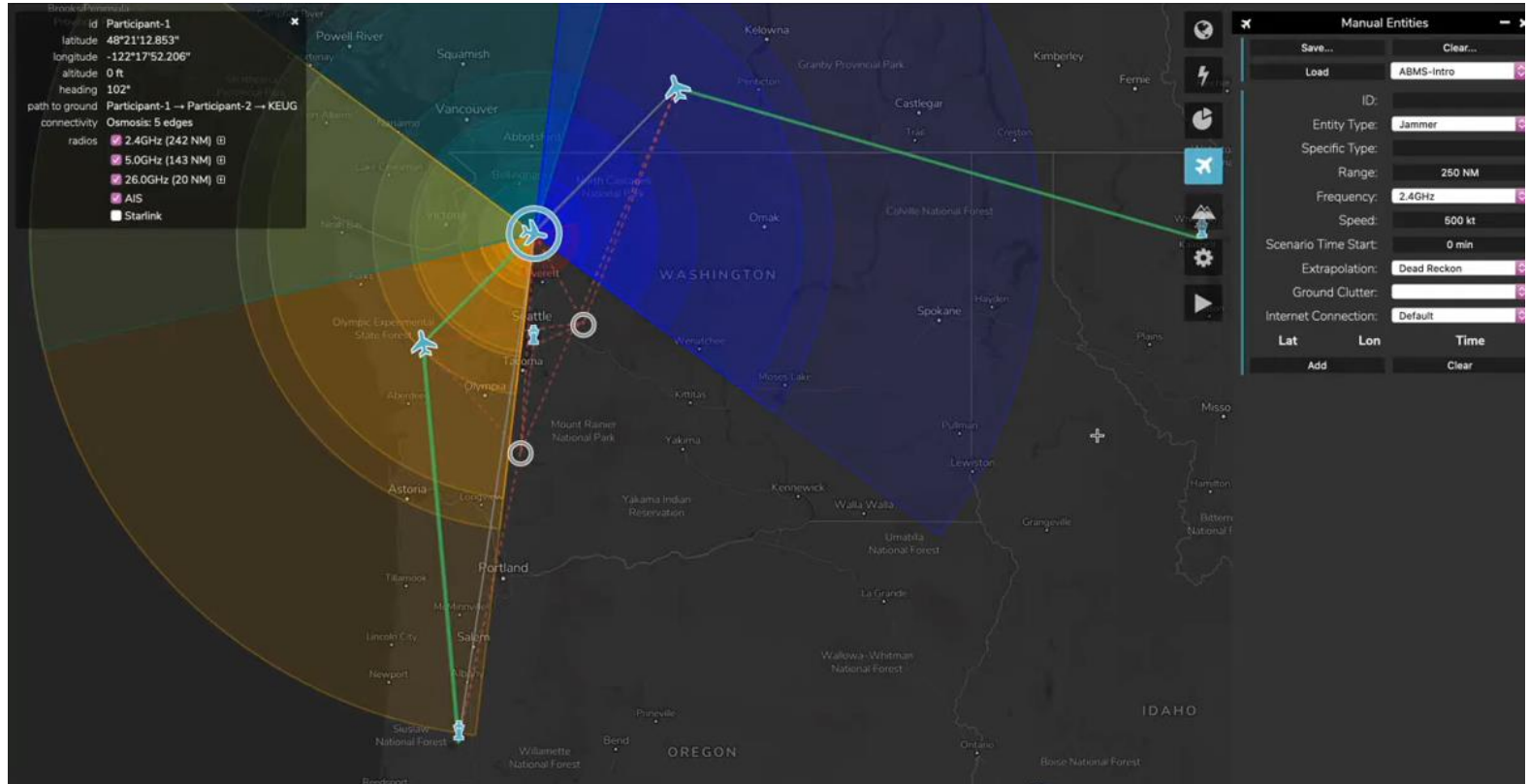
Propagation Modeling by Sector

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20

Airspace Role in Maritime (AIS)

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21

Maritime Mesh – Model for Airborne Mesh

Convergence of Air and Maritime

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23
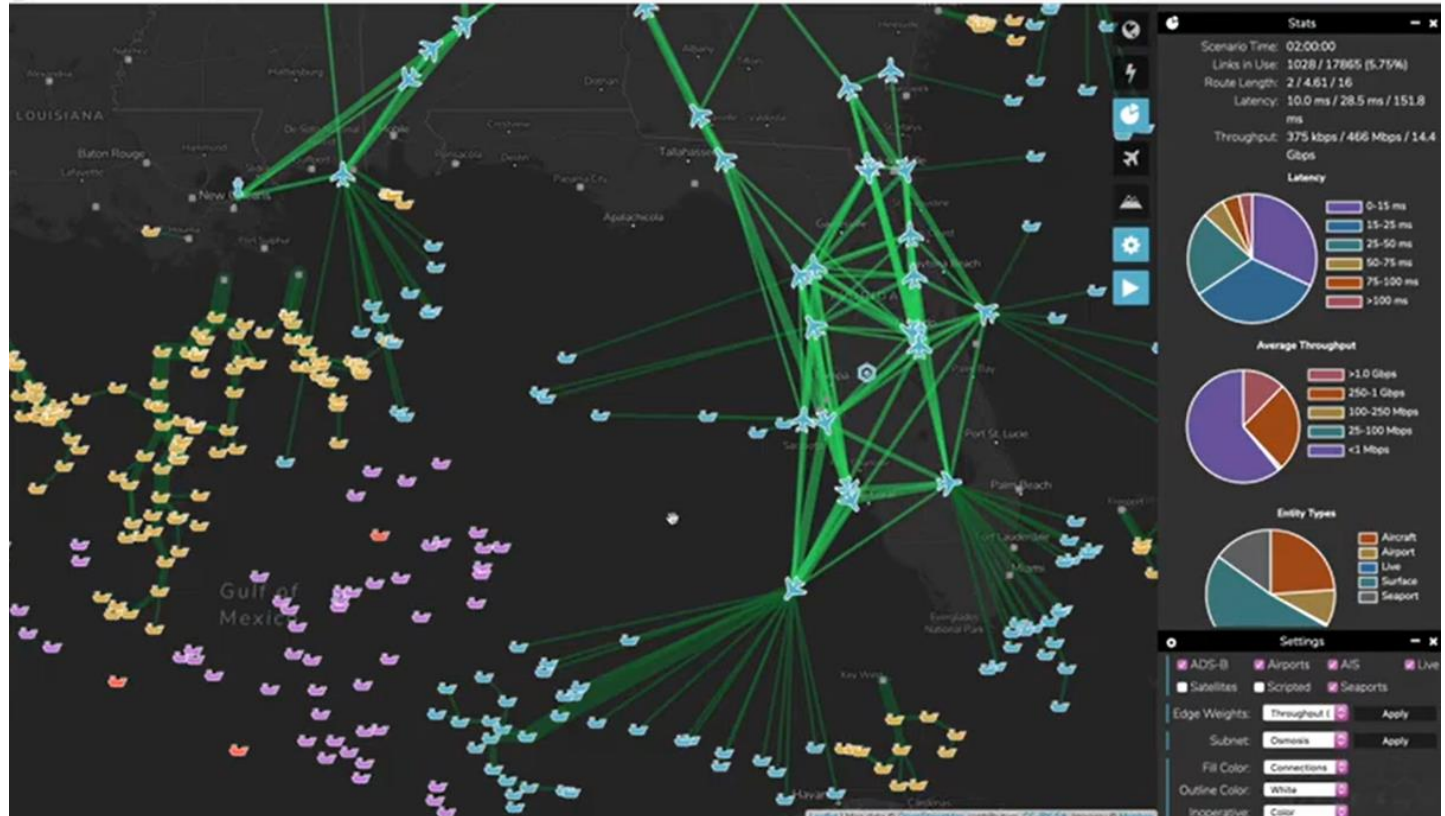
Space Based Asset Overlay (LEO)

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24
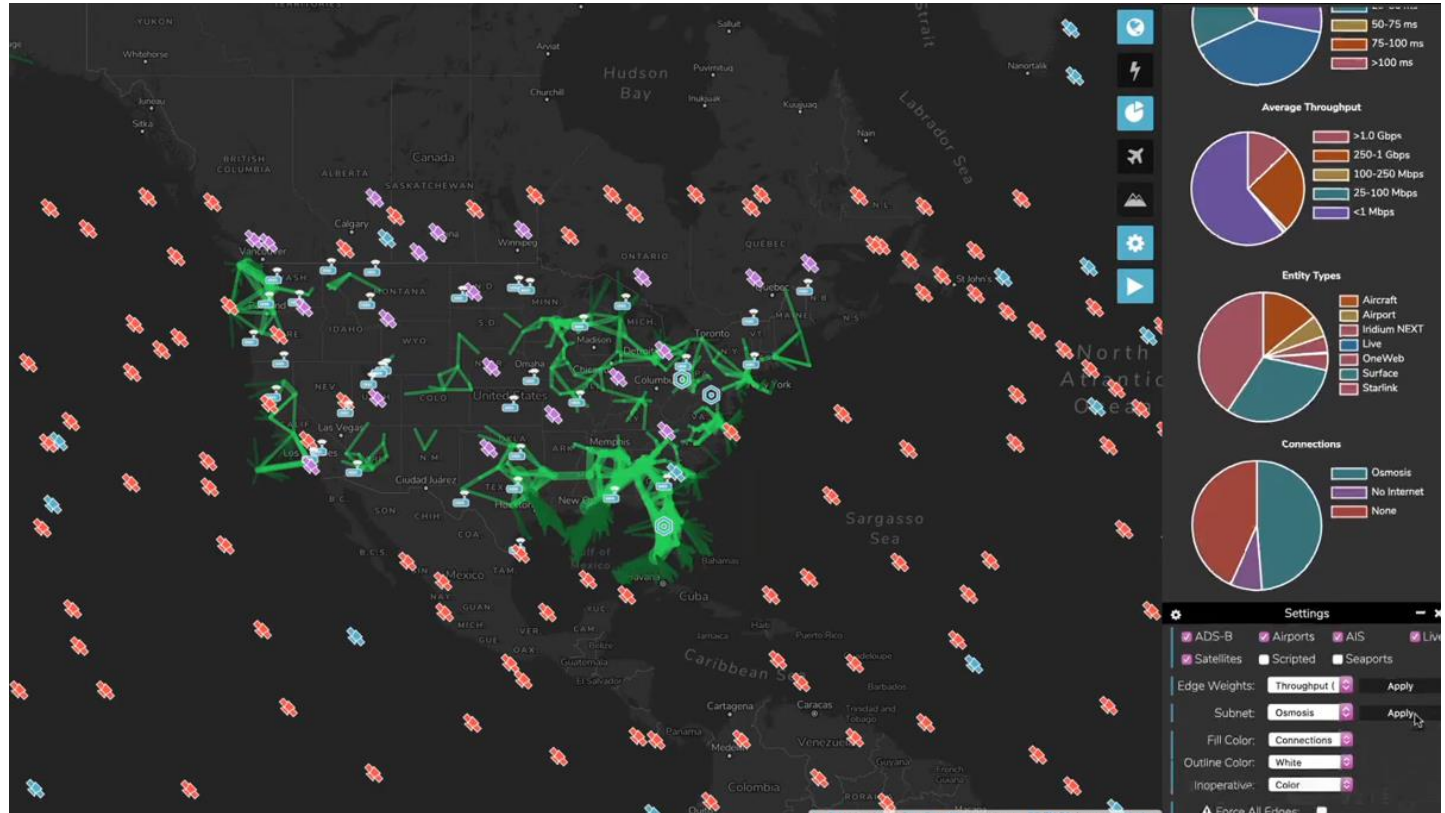
Converging the Elements

Airports
Seaports
ADS-B
AIS
Satcom
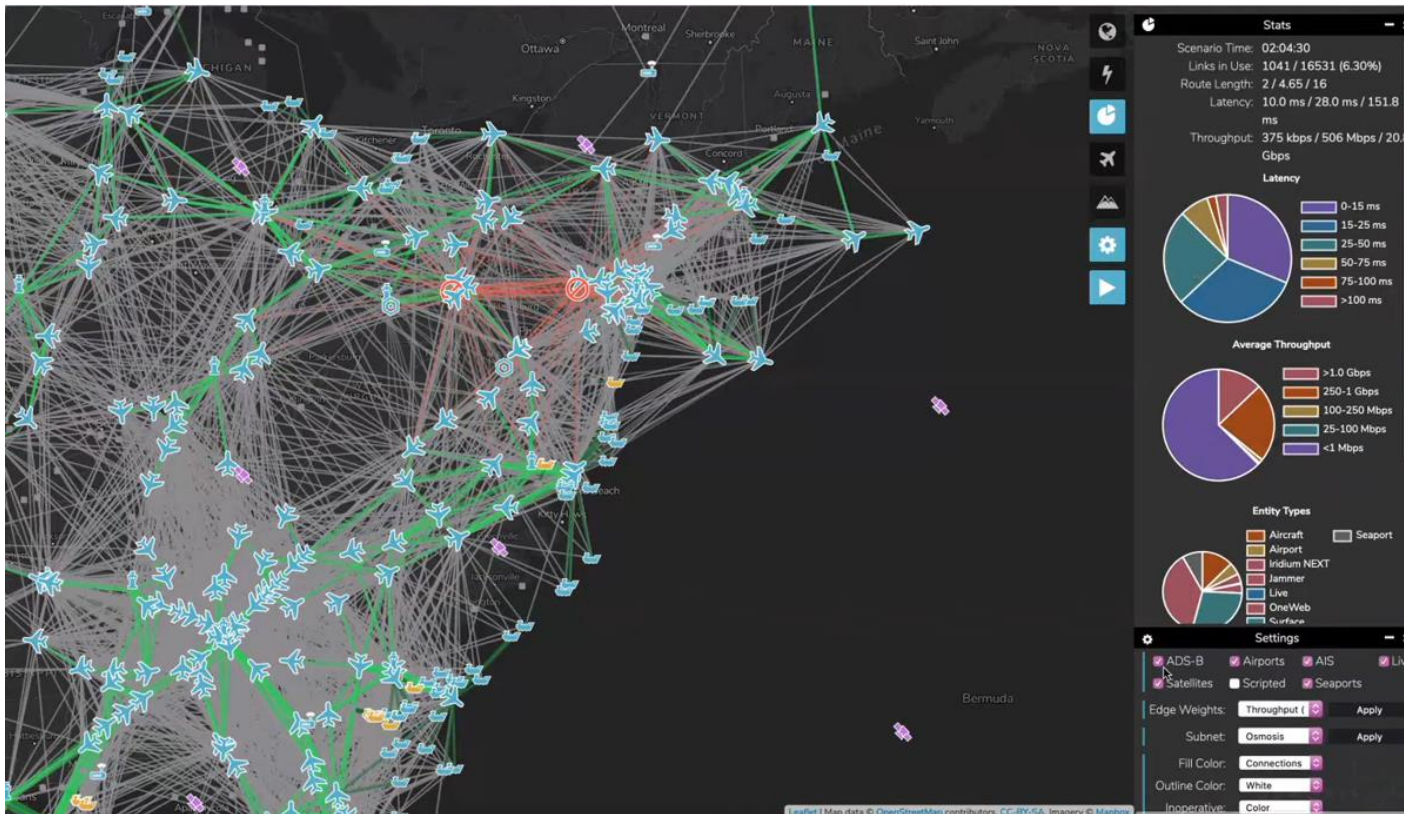
# Infrastructure Outage Modeling
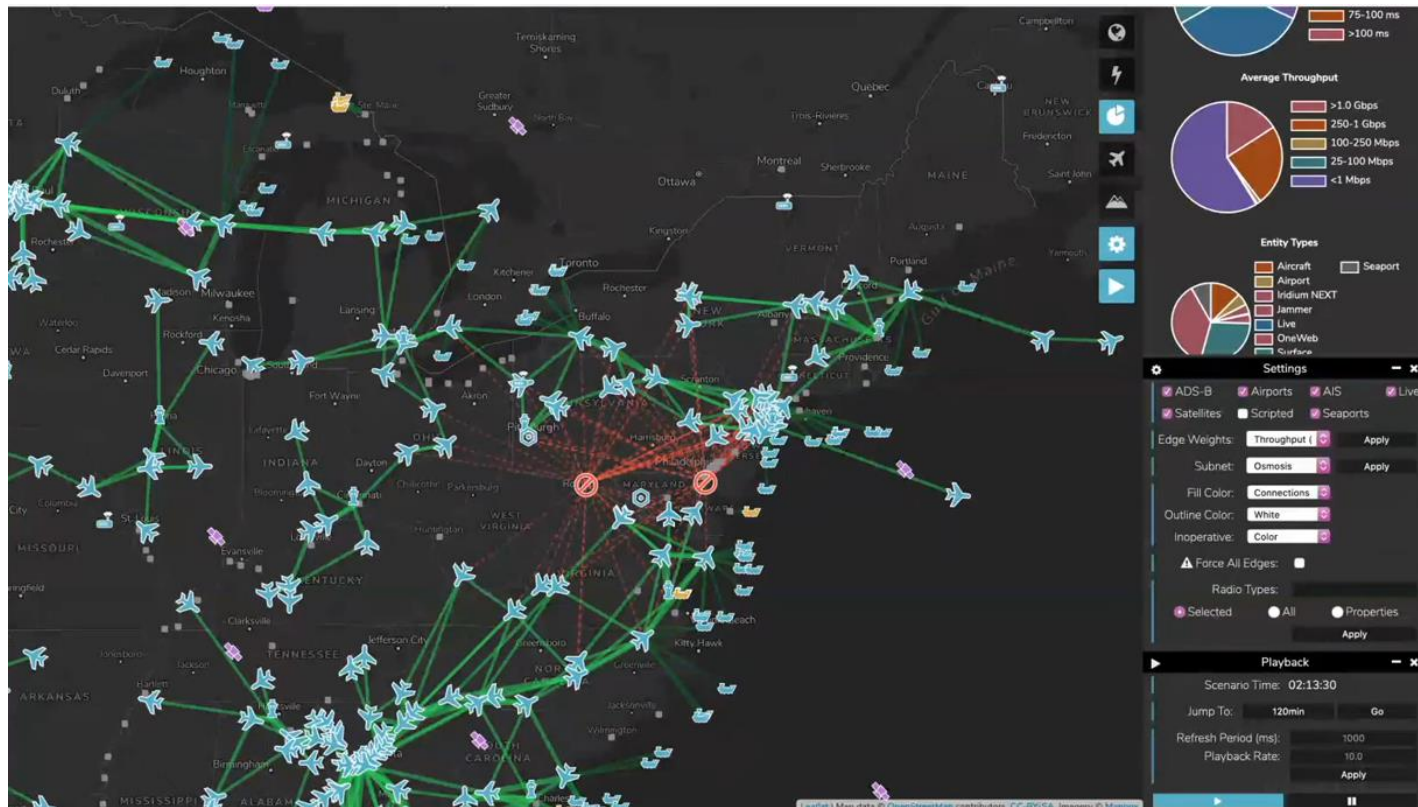
Spectrum Interference Modeling

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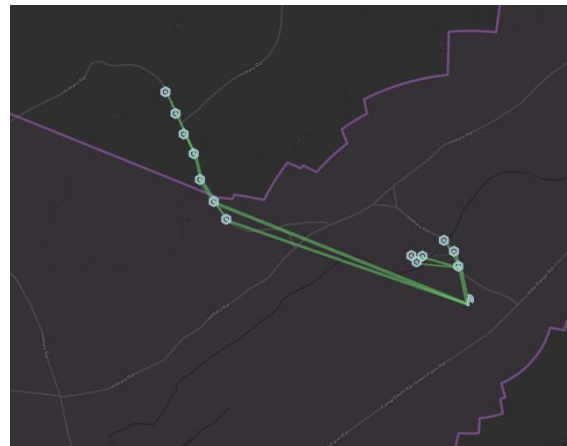
27
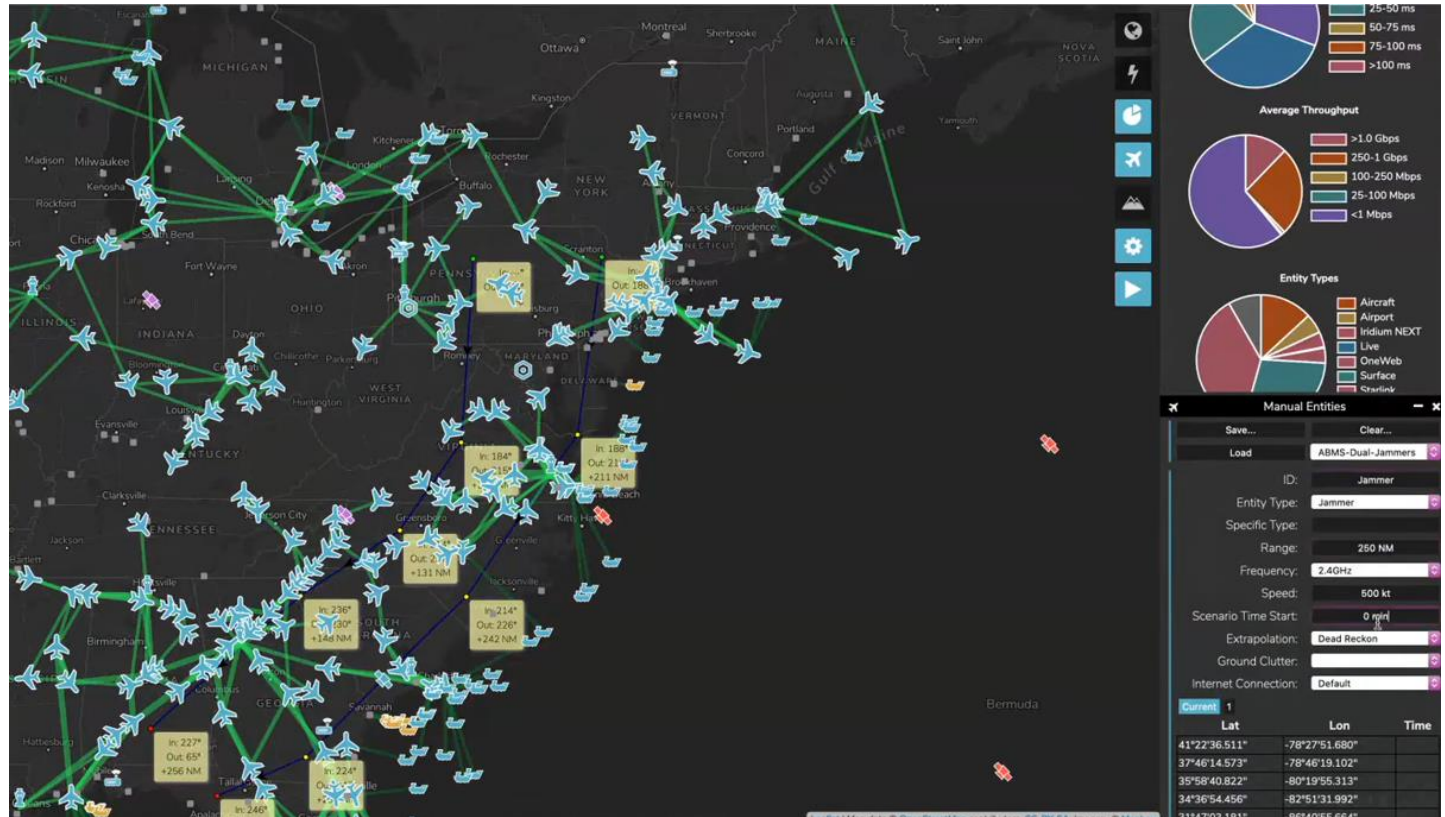
MCAS Miramar
5G/MEC Tactical POC

Challenge

Support electric battlefield of the future autonomous ground and air assets in close proximity to an active airfield in line with final approach.

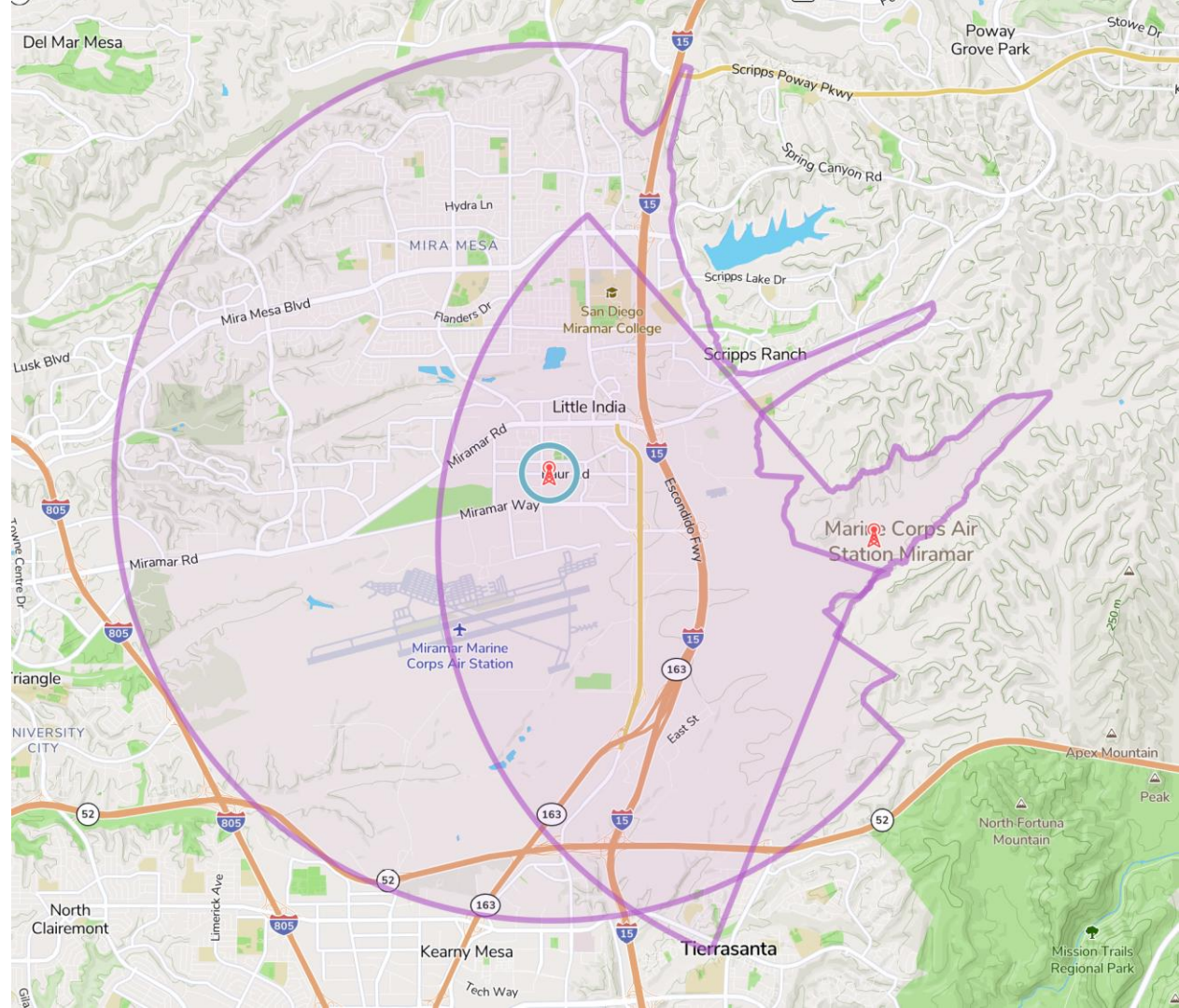# MCAS Miramar Propagation Assessment
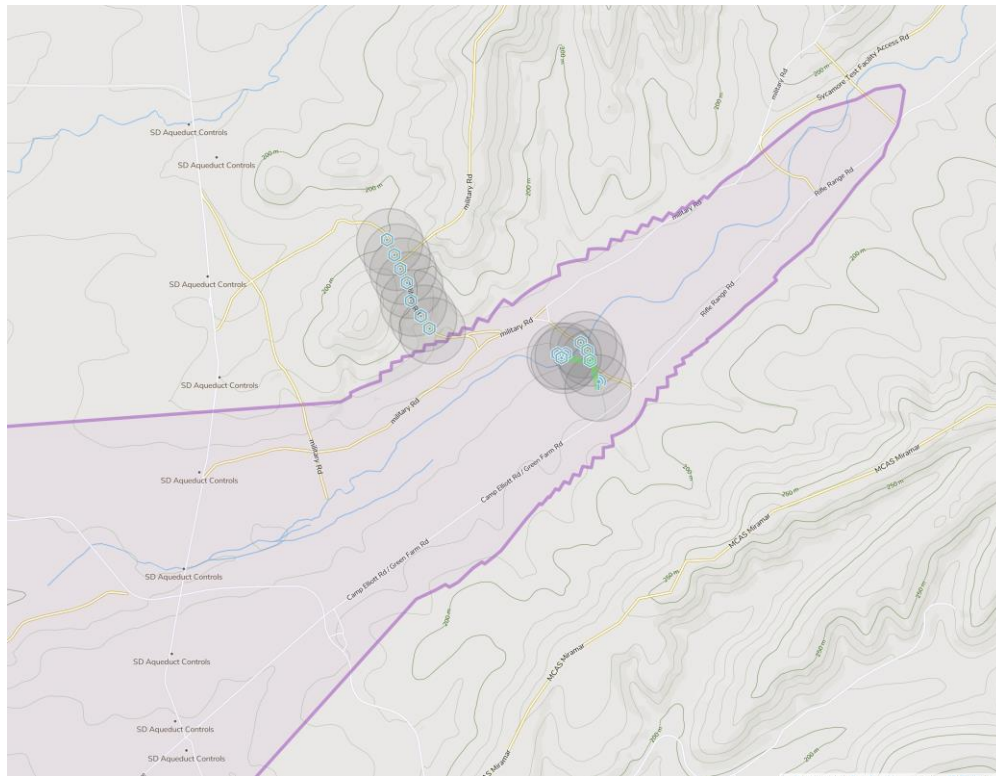
- Wi-Fi (5GHz) shown in grey (Osmosis Mesh)
  - 5.18 – 5.24, 5.74-5.81 GHz
  - 20dBm
  - 100m usable range

- LTE Ericsson 6488 (purple)
  - 3.65 – 3.85 GHz
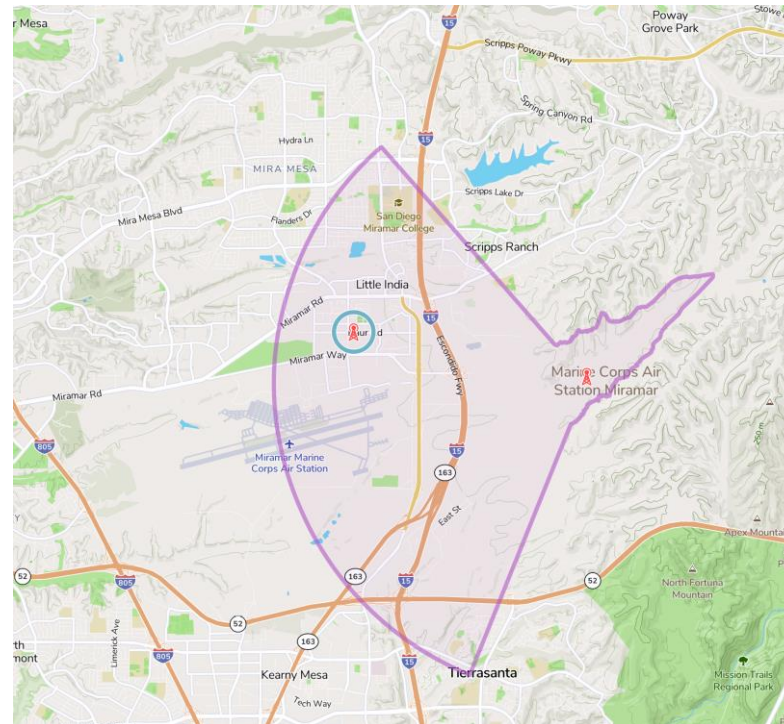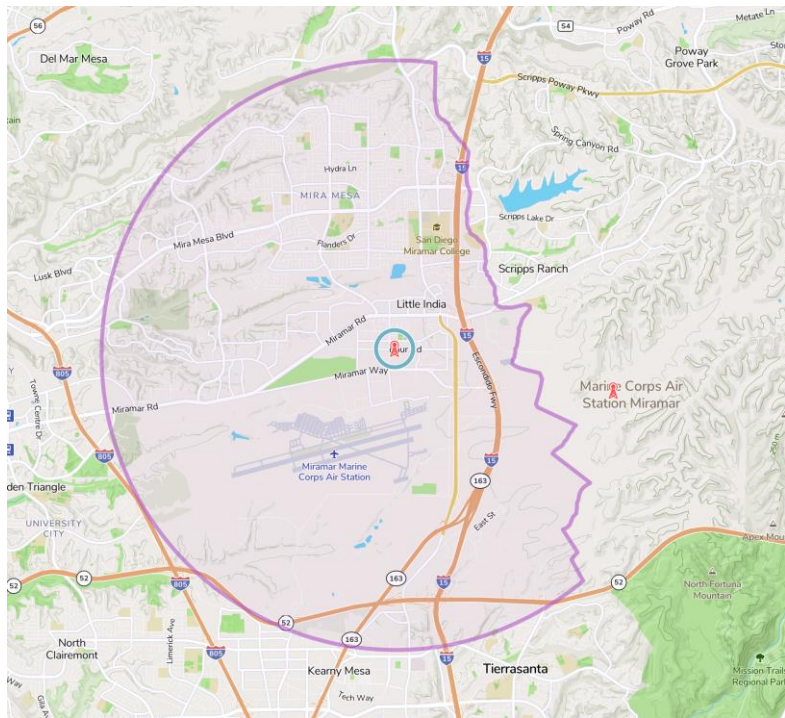 - 47 dBm

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Airfield Impact Analysis

Propagation Refinement Analysis

Discussion

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